

Observations of Occultations of Stars by the Moon made at the Royal Observatory, Greenwich, in the year 1903.

(Communicated by the Astronomer-Royal.)

| Day.           | Phenomenon.             | Telescope.                 | Power. | Moon's Limb. | Mean Solar<br>Time of<br>Observation.<br>h m s | Observer. |
|----------------|-------------------------|----------------------------|--------|--------------|------------------------------------------------|-----------|
| 1903.<br>May 2 | Disapp. 68 Geminorum    | Great Equatorial           | 670    | Dark         | 7 23 38.18                                     | B.        |
| June 2         | " p <sup>3</sup> Leonis | Merz Refractor             | 250    | "            | 9 43 47.44                                     | C. D.     |
| Sept. 3 (a)    | " B.A.C. 7063           | Sheepshanks Equatorial     | 100    | "            | 7 4 29.96                                      | W.        |
| 3              | " "                     | Astrographic Equatorial    | 225    | "            | 7 4 30.52                                      | J. S.     |
| Oct. 30 (b)    | " ρ Aquarii             | " "                        | 225    | "            | 7 10 8.60                                      | H.        |
| 30             | " "                     | Great Equatorial           | 670    | "            | 7 10 9.15                                      | H. F.     |
| 30             | " "                     | Sheepshanks Equatorial     | 100    | "            | 7 10 10.08                                     | W.        |
| 30             | " "                     | Great Equatorial (Corbett) | 120    | "            | 7 10 9.35                                      | V.        |
| 30             | Reapp. "                | Astrographic Equatorial    | 225    | Bright       | 7 46 42.54                                     | H.        |
| 30 (c)         | " "                     | Sheepshanks Equatorial     | 100    | "            | 7 46 43.39                                     | W.        |
| Nov. 4 (d) (e) | Disapp. ξ Arietis       | Astrographic Equatorial    | 225    | Dark         | 6 36 18.32                                     | H.        |
| 7 (f) (g)      | " III Tauri             | Sheepshanks Equatorial     | 100    | Bright       | 11 9(58.52)                                    | W.        |
| 7 (f) (g)      | " "                     | Astrographic Equatorial    | 225    | "            | 11 10 (1.59)                                   | W. S.     |
| 9 (b)          | Reapp. λ Geminorum      | " "                        | 225    | Dark         | 9 28 1.63                                      | H.        |
| 9              | " "                     | Old Altazimuth             | 100    | "            | 9 28 2.76                                      | H. F.     |

| Day.            | Phenomenon.                | Telescope.              | Power. | Moon's Limb. | Mean Solar Time of Observation.<br>h m s | Observer. |
|-----------------|----------------------------|-------------------------|--------|--------------|------------------------------------------|-----------|
| 1903.<br>Nov. 9 | Reapp. $\lambda$ Geminorum | Sheepshanks Equatorial  | 100    | Dark         | 9 28 30.6                                | W. S.     |
| Dec. 2 (d)      | Disapp. W. B. II. 1033     | " "                     | 100    | "            | 12 18 33.44                              | A. C.     |
| 2 (d)           | " "                        | Hodgson Telescope       | 165    | "            | 12 18 34.34                              | P. M.     |
| 2 (d)           | " "                        | Astrographic Equatorial | 100    | "            | 12 18 33.89                              | W. S.     |
| 4 (h)           | " Bradley 686              | " "                     | 225    | Bright       | 8 52 44.20                               | H.        |
| 4               | " "                        | Great Equatorial        | 670    | "            | 8 52 47.24                               | B.        |
| 4               | Reapp. "                   | Astrographic Equatorial | 225    | "            | 9 50 49.43                               | H.        |
| 4               | " "                        | Great Equatorial        | 670    | "            | 9 50 50.40                               | B.        |
| 7 (e)           | Disapp. B. F. 1146         | Astrographic Equatorial | 225    | "            | 13 44 39.64                              | J. S.     |
| 7               | Reapp. "                   | " "                     | 225    | Dark         | 14 31 47.87                              | J. S.     |
| 10 (i)          | Disapp. $\delta$ Leonis    | Sheepshanks Equatorial  | 100    | Bright       | 13 13 50.25                              | W.        |
| 10              | Reapp. "                   | Old Altazimuth          | 100    | Dark         | 13 46 12.60                              | W.        |
| 31 (b)          | Disapp. 75 Tauri           | Astrographic Equatorial | 225    | "            | 8 23 40.13                               | H.        |
| 31              | " "                        | Great Equatorial        | 670    | "            | 8 23 40.00                               | H. F.     |
| 31              | " "                        | Sheepshanks Equatorial  | 100    | "            | 8 23 39.50                               | W.        |
| 31 (b) (j)      | Reapp. "                   | Astrographic Equatorial | 225    | Bright       | 9 6 41.34                                | H.        |
| 31 (g)          | " "                        | Sheepshanks Equatorial  | 100    | "            | 9 6 (45.16)                              | W.        |

Notes.

- (a) Not quite instantaneous.

(d) The limb of the Moon was only slightly defective.

(f) Clouds passing.

(i) Definition not good.
- (b) Instantaneous.

(e) The star was seen right up to the limb.

(h) The star appeared to glide up to and under the limb.

(j) The star appeared from a shallow indentation in the limb.

The apertures of the telescopes used are as follows :—

|                                                | inches.    |                                         | inches    |
|------------------------------------------------|------------|-----------------------------------------|-----------|
| Great Equatorial                               | ... .. 28  | Great Equatorial (Corbett Telescope)... | ... .. 6½ |
| Merz Refractor                                 | ... .. 12¾ | Hodgson Telescope                       | ... .. 6  |
| Astrographic Equatorial (Guiding Telescope)... | 10         | Old Altazimuth                          | ... .. 4  |
| Sheepshanks Equatorial                         | ... .. 6¾  |                                         |           |

The initials H., A. C., B., C. D., H. F., W., J. S., P. M., W. S., V., are those of Mr. Hollis, Mr. Crommélín, Mr. Bryant, Mr. Davidson, Mr. Furner, Mr. Witchell, Mr. Storey, Mr. Melotte, Mr. Stevens, and Mr. Vagg respectively.

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*The "Great" Magnetic Storms, 1875 to 1903, and their association with Sun-spots, as recorded at the Royal Observatory, Greenwich. By E. Walter Maunder.*

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In a paper "On the Relation between Magnetic Disturbance and the Period of Solar Spot Frequency," communicated by Mr. William Ellis to the Royal Astronomical Society in 1899, and appearing in the *Monthly Notices*, vol. lx. No. 2, pp. 142-157, Mr. Ellis has classified magnetic movement or disturbance in the following manner, Class I. including all days free from magnetic irregularity, and showing only the ordinary diurnal movement:—

| Class. | Degree of Disturbance. | Greatest recorded Magnetic Movement.       |                                                  |
|--------|------------------------|--------------------------------------------|--------------------------------------------------|
|        |                        | Declination.                               | Horizontal Force<br>c.g.s. value $\times 10^5$ . |
| I.     | None                   | No magnetic irregularity in either element |                                                  |
| II.    | Minor                  | Less than 10'                              | Less than 50                                     |
| III.   | Moderate               | Greater than 10'                           | Greater than 50                                  |
|        |                        | Less than 30'                              | Less than 150                                    |
| IV.    | Active                 | Greater than 30'                           | Greater than 150                                 |
|        |                        | Less than 60'                              | Less than 300                                    |
| V.     | Great                  | Greater than 60'                           | Greater than 300                                 |

Adopting the same classification, there were nineteen "great" storms in the twenty-nine years from 1875 January 1 to 1903 December 31. The extreme amplitude of the movements in declination exceeded one degree in all these cases but two. In these two cases it exceeded 55': but as the movement in horizontal force exceeded 350 on the c.g.s. scale, they have also been ranked as "great" storms, in accordance with Mr. Ellis's definition. The nineteen are thus distinctly the most important "storms" of the entire period of twenty-nine years.

All the nineteen without exception took place when there was present on the Sun a group of spots with projected area of over 1000 millionths of the area of the visible disc; or when a group, at one time very large, had returned in a diminished form to the central meridian.

With one exception—No. 18—all the storms began with an exceedingly characteristic movement of the magnets, generally only moderate in amount, but distinguished by its suddenness. This appeared simultaneously in the registers of declination, horizontal force, vertical force, and earth currents, the remarkable feature of the movement being its instantaneousness. This characteristic movement is referred to in Tables I. and II. by the word "sharp" in the column "Character of Beginning." Taking the time of this swift characteristic movement as that of the commencement of the storm, it would appear that these

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